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THE LIFE HISTORY OF *LACHNOCNEMA BIBULUS* (FAB.)
IN KENYA (LEPIDOPT., LYCAENIDAE)

By C. CRIPPS and T. H. E. JACKSON, F.R.E.S.

(With a note on the larval gland by Dr. H. ELTRINGHAM, F.R.S.).

WITH PLATE 1 AND ONE TEXT-FIGURE.

(Read 5th June, 1939.)

THE senior author of this paper is alone responsible for the paragraphs placed within inverted commas.

In 1937, *Trans. R. ent. Soc. Lond.* **86**: 210, I gave a description of the eggs and larvae of *Lachnocnema bibulus* (Fab.), with some observations on the feeding habits of the larva. The larvae were found among immature Membracids and Jassids on the terminal shoots of various plants, chiefly certain species of thorny Acacia, where they were feeding on "honey-dew" produced by these insects. The Jassids were being "milked" by the larvae by a method similar to that employed by the ants always in attendance on these insects. Having found a suitable Jassid, the larva reared up on its abdominal segments, and poised itself over the anal portion; it then stroked the Jassid rapidly with its prolegs, and a drop of "honey-dew" was immediately produced from the anus and devoured. The prolegs of the larva are specially developed and adapted for this purpose. No pupae were found, and it seemed that, at some stage in their development, the larvae left the shoots of the tree.

Our knowledge respecting the further development of *Lachnocnema* is due to the perseverance and careful personal observations of Mr. C. Cripps, of Soy, Kenya. He has sent me all his notes on the subject, and also the coloured drawings which accompany this paper.

Mr. Cripps found the eggs upon a species of *Vernonia*, and not among Membracids, though these were present on the plant. Some years ago I found the *Lachnocnema* ovipositing, among ants, on a low growing species of *Combretum*, and Membracids were not present. The ants, in this case, were perforating the main veins on the undersides of the leaves, and feeding on the resultant flow of sap; the eggs were always placed close to these incisions. The young larvae, and both sexes of the imago, were also feeding on this sap. There were no signs of any but very young larvae, and no pupae were to be found.

"The egg is laid at about 2 p.m. to 3 p.m. on sunny days on a species of *Vernonia*, a shrub common on the edges of old native clearings. The young terminal shoots are often covered with Membracids and Jassids, and these are attended by masses of ants. I have seen the female ovipositing on several occasions, and she appears to be particular about the selection of a suitable leaf, those chosen being the old leaves about half-way down the stem. I have not seen a female ovipositing on the young shoots among ants, Jassids, etc., nor have I found eggs or larvae there" (C.C.). The leaves of the *Vernonia* are often attacked by a minute orange fungus, and the eggs are sometimes laid among this, rendering them almost invisible, since they are of the same size and colour as the fungus.

"Soon after the larva has hatched an ant finds it, and investigates it with its antennae for a few seconds. The ant then seizes the larva in its mandibles, from the side, and gently pulls it free of the leaf. The larva, stiffening and curling slightly, is lifted and turned upon its back; it is now easily and quickly carried down the branch to the base of the shrub. It is there dropped, and then finds its way to a resting-place among the ants. Sometimes several ants approach the larva on its leaf, each taking hold of it, but always from the side, when a tug-of-war ensues until one eventually wins and carries off the prize. Sometimes the ant will drop the larva when a foot or so from the ground. I collected and placed full-grown larvae on the top of the shrub; upon each occasion an ant came and inspected it for a moment, then seized it, and took it down the stem to the nest. The ants are extremely strong; I saw one lift a full-grown larva, with another ant attached, and walk off with them down the shrub. On one occasion, an ant was descending the stem with a small larva I had placed at the top of a branch, when, about half-way down, they came to a hole in the bark on the underside of the stem; the ant popped the larva into the hole. Next day, I examined the hole and found the larva still there, and it remains there as I write, attended by ants all the time, who fight with each other over guarding and tickling it. I examined several other branches with holes in them; each hole contained a larva, and ants were at the entrance. The holes are always on the undersides of the stem, protected from the weather, and the larvae were always very small" (C.C.).

Having got thus far with his investigations, Mr. Cripps opened up one of the ant nests at the foot of the shrub. They were not very deep, and were made among the roots in black earth. Here he found larvae, pupae, and sometimes the freshly emerged imago.

"I opened an ant run at the base of a Mimosa thorn (*Acacia stenocarpa* Hochst.), the roots of which were within a foot of a *Vernonia* shrub. Larvae, in various stages, were found, lying quietly, five or six to a run, and several pupae were attached to the roots roofing the runs. Larvae and pupae were found also in the runs among the *Vernonia* roots. The pupae had no puparium whatsoever; they hung, head down, from the root, with the hollow of the run below them, attached by the anal extremity. There was no protection of any kind" (C.C.). The pupa-case is hard and highly polished, as in the case of some other associated Lycaenids, and this is, no doubt, sufficient protection from the ants.

"The larvae in the runs were seen in any position, facing the entrance or the reverse, and at various depths, sometimes several together, sometimes alone. Ants were constantly in attendance, stroking the larvae with their antennae, sometimes as many as six or eight at the same time. At the same spot underground, I found, at about 8 a.m. on a very dull, cloudy, day, two female butterflies with wings fully spread. They walked slowly out, attended all the time by ants who stroked them with their antennae" (C.C.).

The legs of *Lachnocnema* are covered above with long hair, a protective adaptation common to other Lycaenids which spend their early stages in the nests of ants. It seems certain that the hair prevents attack by the ants during emergence from the nest.

In the nests were found also Heterocerous larvae, boring into the roots of the shrubs, and producing masses of sticky exudate in which they lay. These borers appeared to be only among the ant runs, and not on the other side of the trees and shrubs away from the ants. It is possible that they prefer the better aerated conditions pertaining to the nests.

In order to test out the food of the *Lachnocnema* larvae in the runs, Mr. Cripps took several home with him, as well as some of the ants.

"I brought up a full-grown larva from under a *Vernonia* on a piece of bark with five or six ants, and placed them all under an inverted tumbler on my table. These were kept under my observation from 2.30 to 6.30 p.m. At six o'clock I was rewarded by seeing an ant approach the larva from in front. It started a gentle tickling process with its antennae over the proximal portion of the larva. After submitting to this for some time the larva suddenly rose up on its abdominal segments, felt the ant with its forelegs, and then rapidly vibrated these against the sides and cheeks of the ant. The latter vibrated its antennae for a second, then spread them wide apart, and kept them still. The larva placed its mouth-parts within the mandibles of the ant, which were now wide open; a small drop of 'honey-dew' was regurgitated, appearing as a minute shining drop at the mouth of the ant. The larva seized this drop of 'honey-dew' in its jaws, and gently drew away, still sitting up over the ant; it appeared to absorb the drop slowly until it had all disappeared. The larva then dropped to the ground and walked away. I observed this again the next afternoon and upon several occasions; sometimes nothing was produced by the ant, presumably because it had nothing to give. The ants do not always approach from in front. I have seen them at the sides, when the larva will lift and turn towards the head of the ant, and go through the process which lasts about two minutes. I have often seen an ant stroking a larva, when suddenly the latter would give a lightning shake of its fore parts and turn its head away; this happens often, but does not serve to frighten the ant" (C.C.).

It is possible that this is, in fact, a "frightening" movement when the larva does not require food. With concentrated food of this sort it is probable that very infrequent feeding is necessary. Mr. Cripps states that the excreta of the larva is liquid, white and shining, and very like the "honey-dew" itself. Although careful observations were made, and although the larva possesses a well-developed gland on the anal segments, an ant was never observed to feed from this gland, nor was any liquid ever actually seen at the gland. I think, however, that the association is almost certainly mutual, and that the ants do, in fact, feed from the gland; their behaviour in constant attendance, stroking the larva, suggests that this is the case.

The food of *Lachnocnema bibulus* is, therefore, "honey-dew," and it appears that several methods are employed by the butterfly larva to obtain this substance. (1) From the excreta of Membracids; (2) from the regurgitations of ants; (3) from the sap of certain plants. It would be interesting to know what are the chemical differences between the substances obtained from these different sources, and what exactly is the concentrate obtained by the larvae from all three. In at least one case something must be absorbed before the *Lachnocnema* larva feeds on the "honey-dew," i.e., in the passage through the stomachs of the Membracids or Jassids.

Both W. A. Lamborn (1913, *Trans. ent. Soc. Lond.* 1913) and C. O. Farquharson (1921, *Trans. ent. Soc. Lond.* 1921) found the larva of *Lachnocnema bibulus* in West Africa, and published notes on the life-history. The former author stated (page 471) that a captive larva did actually eat a number of Jassids, but he also says that it had not fed for 24 hours. It seems probable that the Jassids can only produce "honey-dew" when they themselves are feeding on a plant, and that the larvae found no food available, and eventually, from hunger, devoured the insects. Farquharson never actually observed a Jassid eaten, although he states that he found insect remains in the grass. The

evidence seems to show, especially after Mr. Cripps' observations, that the larvae are not actually carnivorous, except under exceptional conditions.

The pupa of *Lachnocnema*, hitherto unknown, is described below.

Placed below ground in the ant runs, and attached head downwards, to the roots of the tree or shrub, by the anal extremity.

Shape squat, broad, much shortened, angulate at the head-case and shoulders; abdominal segments broad, evenly excurved from anal extremity and incurved to a pronounced constriction or "waist" at a point about the centre of the wing-cases. A lateral view shows that this "waist" extends round and above the pupa, the abdominal and thoracic segments being raised and domed above it. Colour pale dirty brown, wing-cases lighter; surface highly polished. Length, 11 mm.; width, 8 mm. at the broadest part.

THE LARVAL GLAND IN *LACHNOCNEMA BIBULUS* (FAB.)

By H. ELTRINGHAM, M.A., D.Sc., F.R.S.

Two larvae, fixed in Blès Solution, were submitted for investigation. An examination of the dorsal half of a longitudinal section showed, on the inner surface of the eighth segment, a pale patch lying between the hypoderm and the cuticle. Transverse sections were made of this eighth segment.

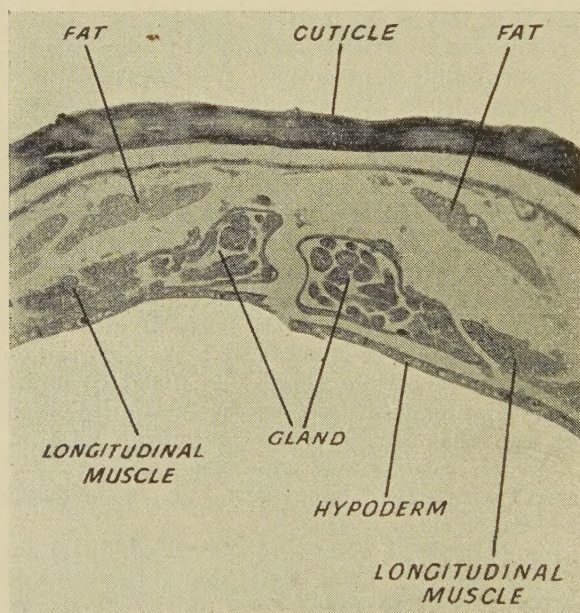


FIG. 1.—*Lachnocnema bibulus* (Fab.). Transverse section of 8th segment of larva, $\times 50$.

These sections show a flattened gland of bifid structure, the division being in the long axis of the body, *i.e.* along the dorsal centre line. There is a containing membrane, and glandular lobes cut in various planes. Some of the lobes show comparatively large cells, and others have a more fibrous appearance.



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LIFE HISTORY OF *LACHNOCNEMA BIBULUS* (Fab.).

No very obvious ducts are apparent. Careful examination of the whole series fails to show any special opening to the exterior, nor is any such opening visible on examination of the dorsal cuticle from the outside. The active appearance of the gland in section suggests that it is functional, and if its secretion does in fact make its way to the exterior, it must do so by some form of diffusion or osmosis. There would be nothing very unusual about this as I have found glands in Lepidoptera which are very obviously active and functional but which show no evident external orifice.

The chitinous cuticle of this larva shows the usual pore canals, and there seems no reason why the excretion, if any, should not occur through them. As usual in such larvae, there are numerous subcuticular muscle-fibres and the contraction of these would cause pressure on the glands with a tendency to expel the contents.

EXPLANATION OF PLATE 1.

Lachnocnema bibulus Fab.

FIG. 1, egg; 2, larva; 3, larva, showing anal end; 4, larva pupating; 5, 3rd day; 6, pupa casing; 7, 10th day; 8, larva being fed by ant; 9, larva being carried to ant's run; 10, ant clasping larva at side, the larva being curled and rigid; 11, young larva in hole half-way down *Vernonia* and attended by ants; 12, *Vernonia* leaf showing egg, and early stage larva; 13, sketch of position of larva and pupae underground, with ants; 14, *Lachnocnema* showing underside; 15, the same enlarged, hairs are on the upperside of legs; 16, male; 17, 18, female. The figures are by C. Cripps.

